6898437

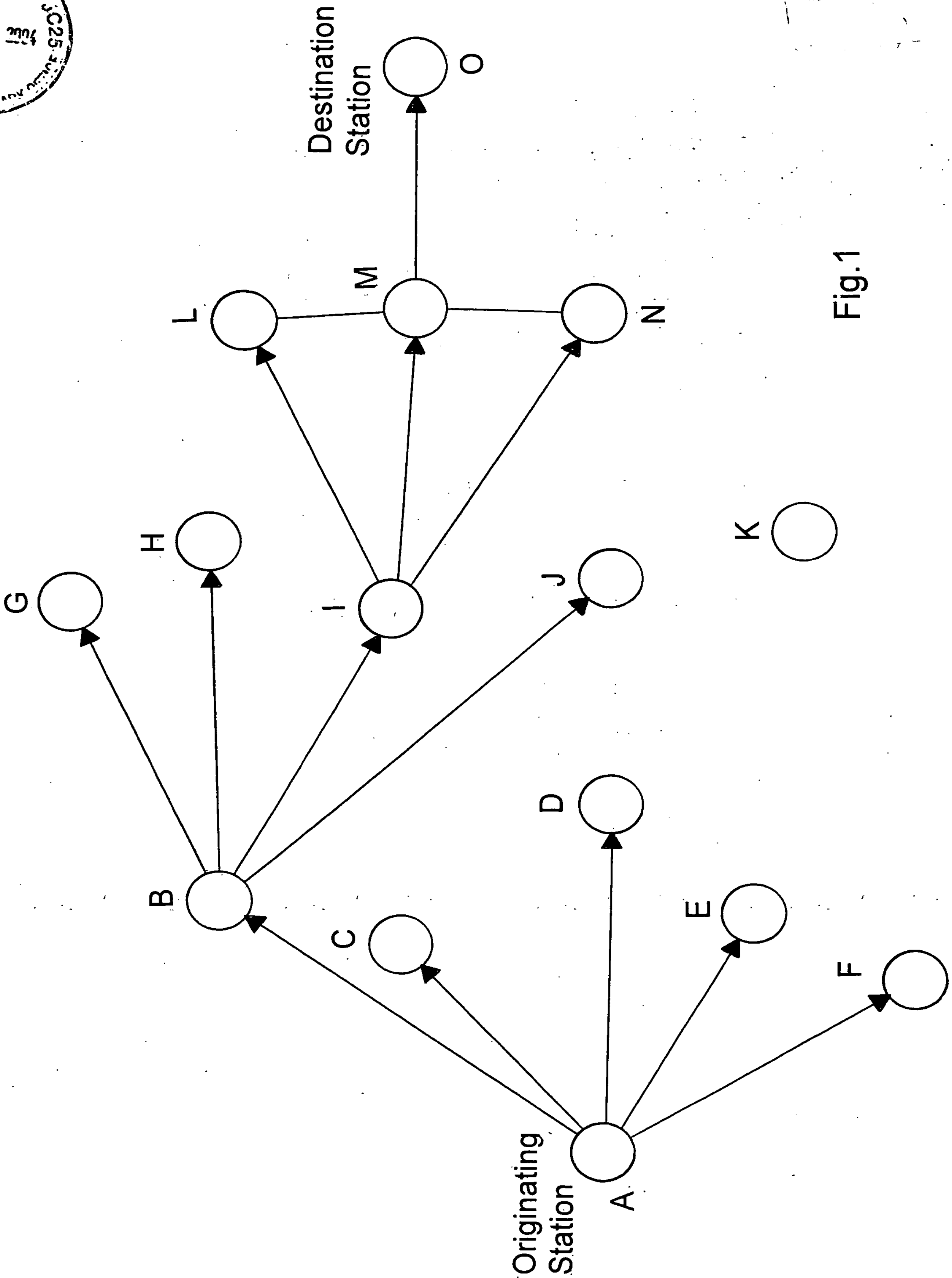


Fig.1

Fig.2A

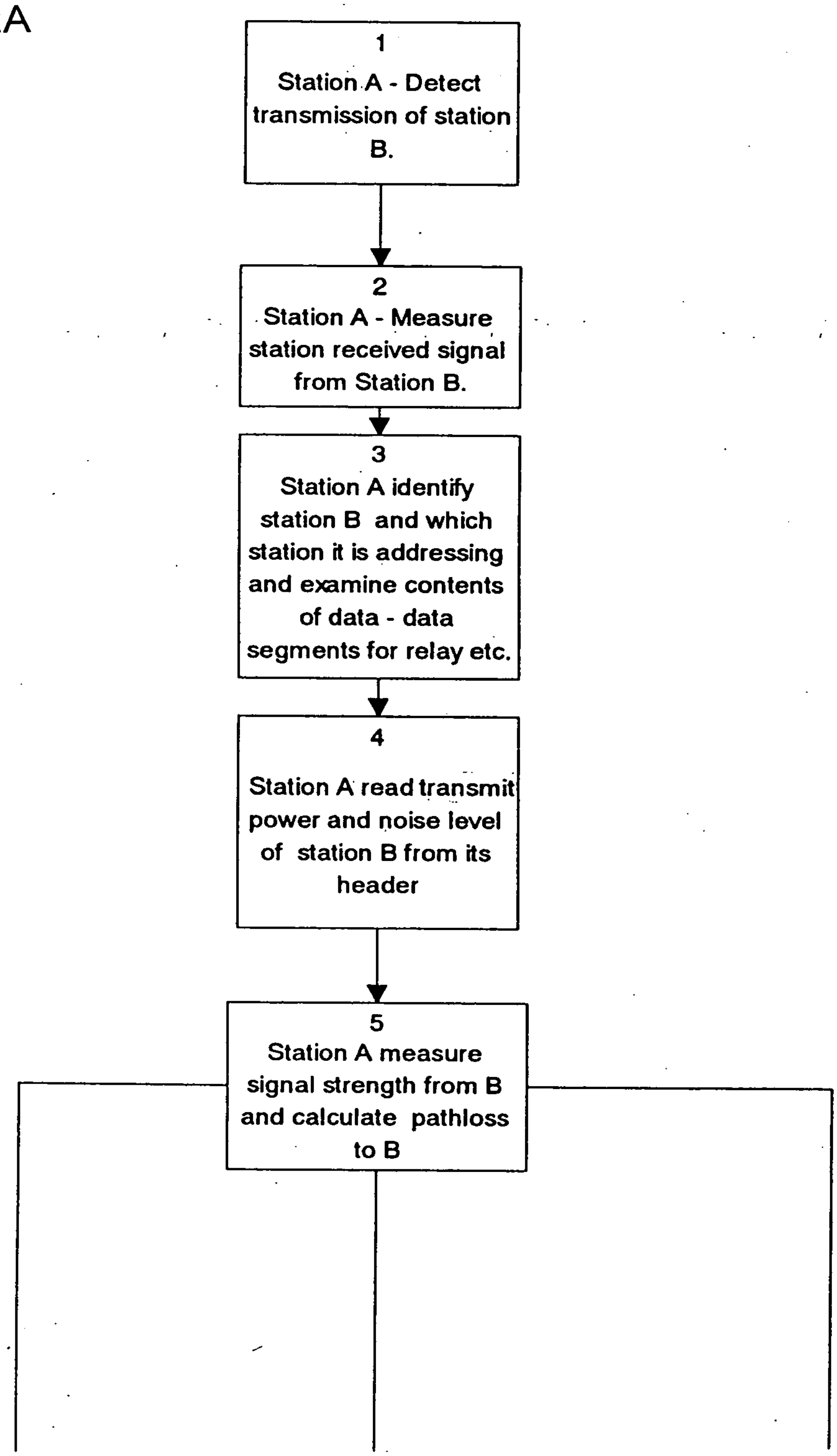

1
Station A - Detect transmission of station B.
2
Station A - Measure station received signal from Station B.
3
Station A identify station B and which station it is addressing and examine contents of data - data segments for relay etc.
4
Station A read transmit power and noise level of station B from its header
5
Station A measure signal strength from B and calculate pathloss to B

Fig.2B

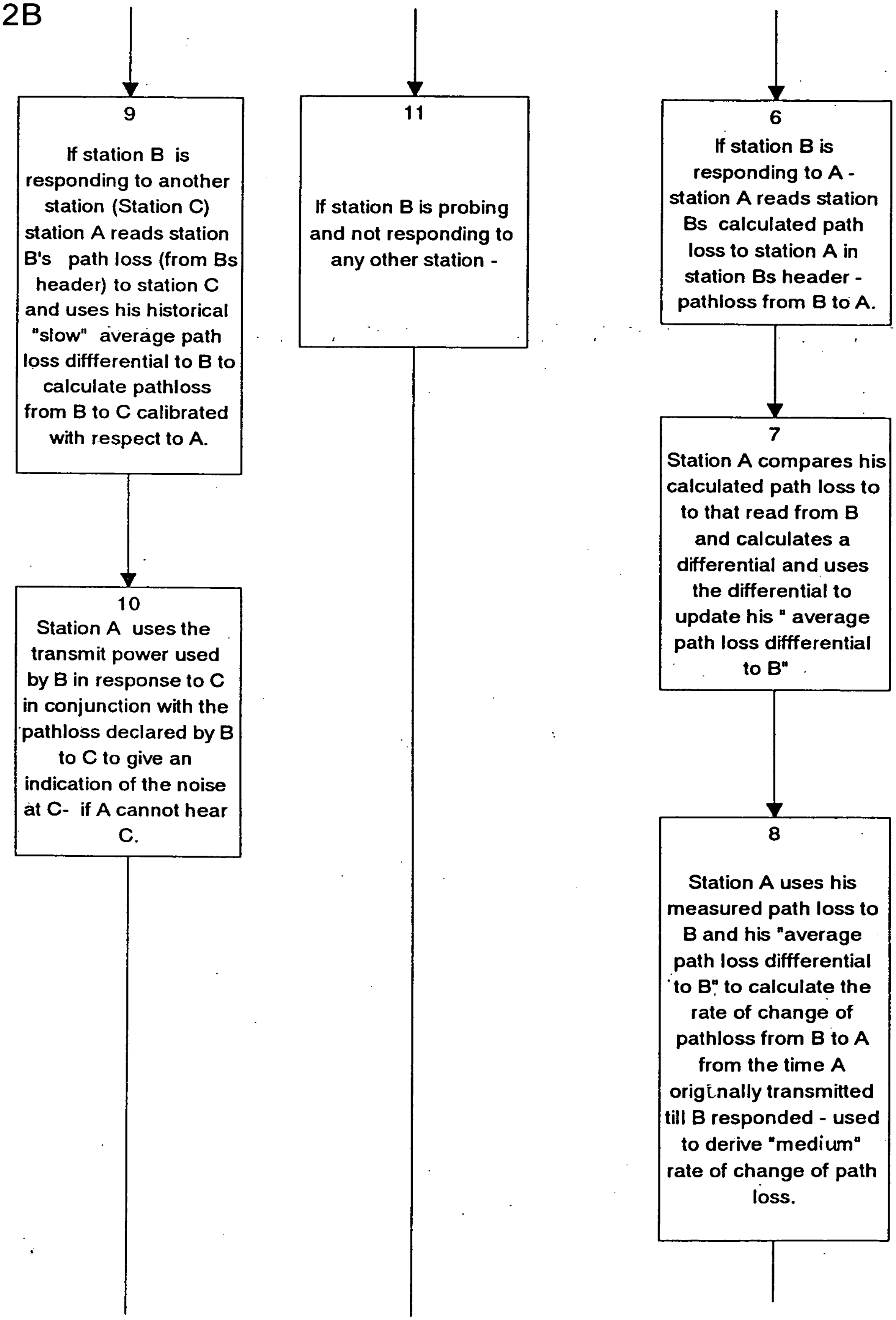

9
If station B is responding to another station (Station C) station A reads station B's path loss (from Bs header) to station C and uses his historical "slow" average path loss diffferential to B to calculate pathloss from B to C calibrated with respect to A.
10
Station A uses the transmit power used by B in response to C in conjunction with the pathloss declared by B to C to give an indication of the noise at C- if A cannot hear C.
11
If station B is probing and not responding to any other station -
6
If station B is responding to A - station A reads station Bs calculated path loss to station A in station Bs header - pathloss from B to A.
7
Station A compares his calculated path loss to to that read from B and calculates a differential and uses the differential to update his " average path loss diffferential to B"
8
Station A uses his measured path loss to B and his "average path loss diffferential to B" to calculate the rate of change of pathloss from B to A from the time A origInally transmitted till B responded - used to derive "medium" rate of change of path loss.

Fig.2C

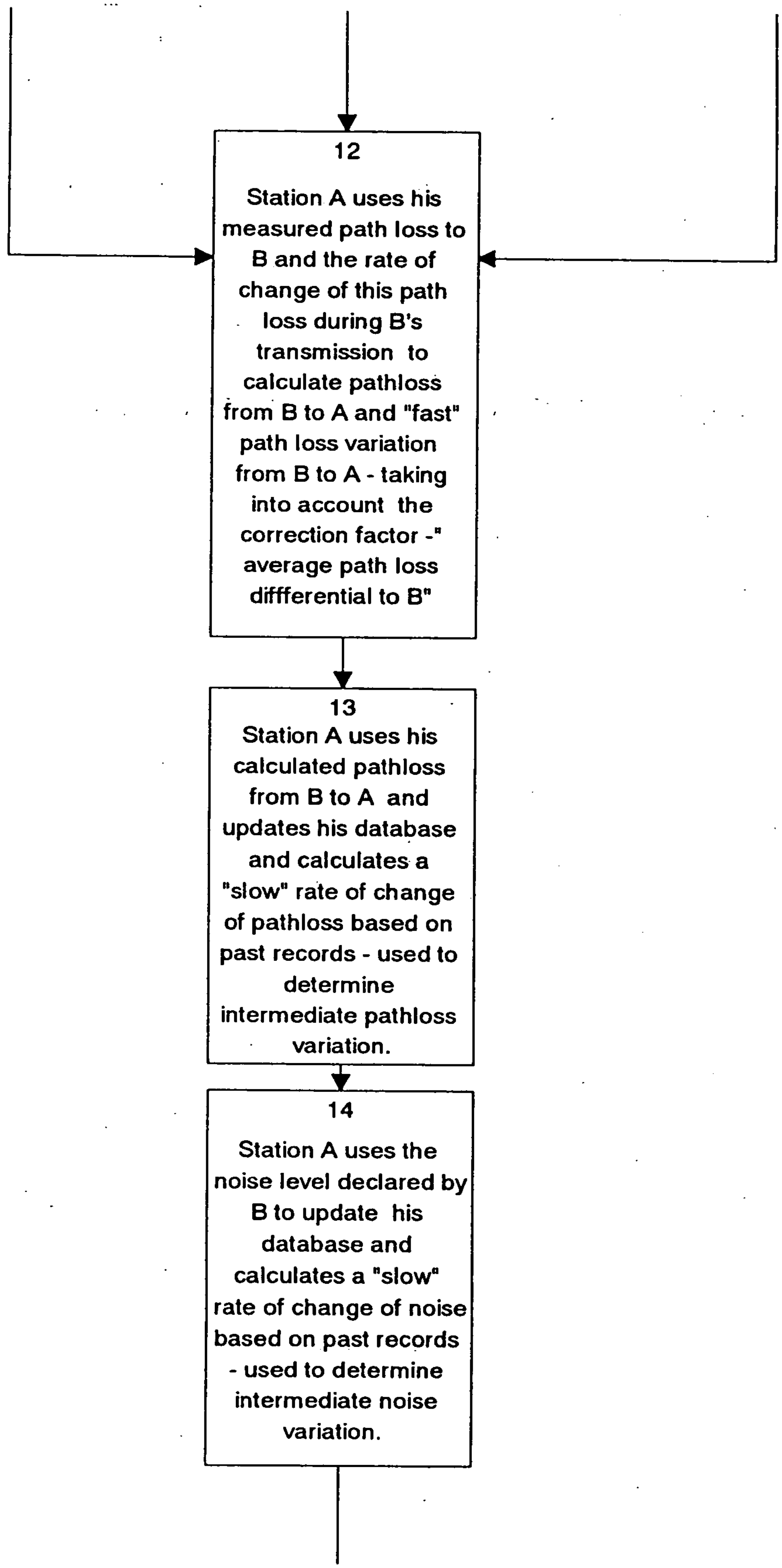

12
Station A uses his measured path loss to B and the rate of change of this path loss during B's transmission to calculate pathloss from B to A and "fast" path loss variation from B to A - taking into account the correction factor -" average path loss diffferential to B"
13
Station A uses his calculated pathloss from B to A and updates his database and calculates a "slow" rate of change of pathloss based on past records - used to determine intermediate pathloss variation.
14
Station A uses the noise level declared by B to update his database and calculates a "slow" rate of change of noise based on past records - used to determine intermediate noise variation.

Fig.2D

15
Station A uses calculated pathloss from B to A in conjunction with station B local noise (from Bs header) to calculate transmit power required to reach B - taking into account the rate of change of pathloss and noise from database both "fast" and "medium".

16
If the measured data indicates a "minimum" in path loss and/or a "minimum" in noise floor at B an "opportunity" is identified between A and B.

17
If A has data for B as a final destination or a relay - and the "opportunity" identified by A to B is better than any other "opportunity" to any other station at that moment - A decides to transmit to B.

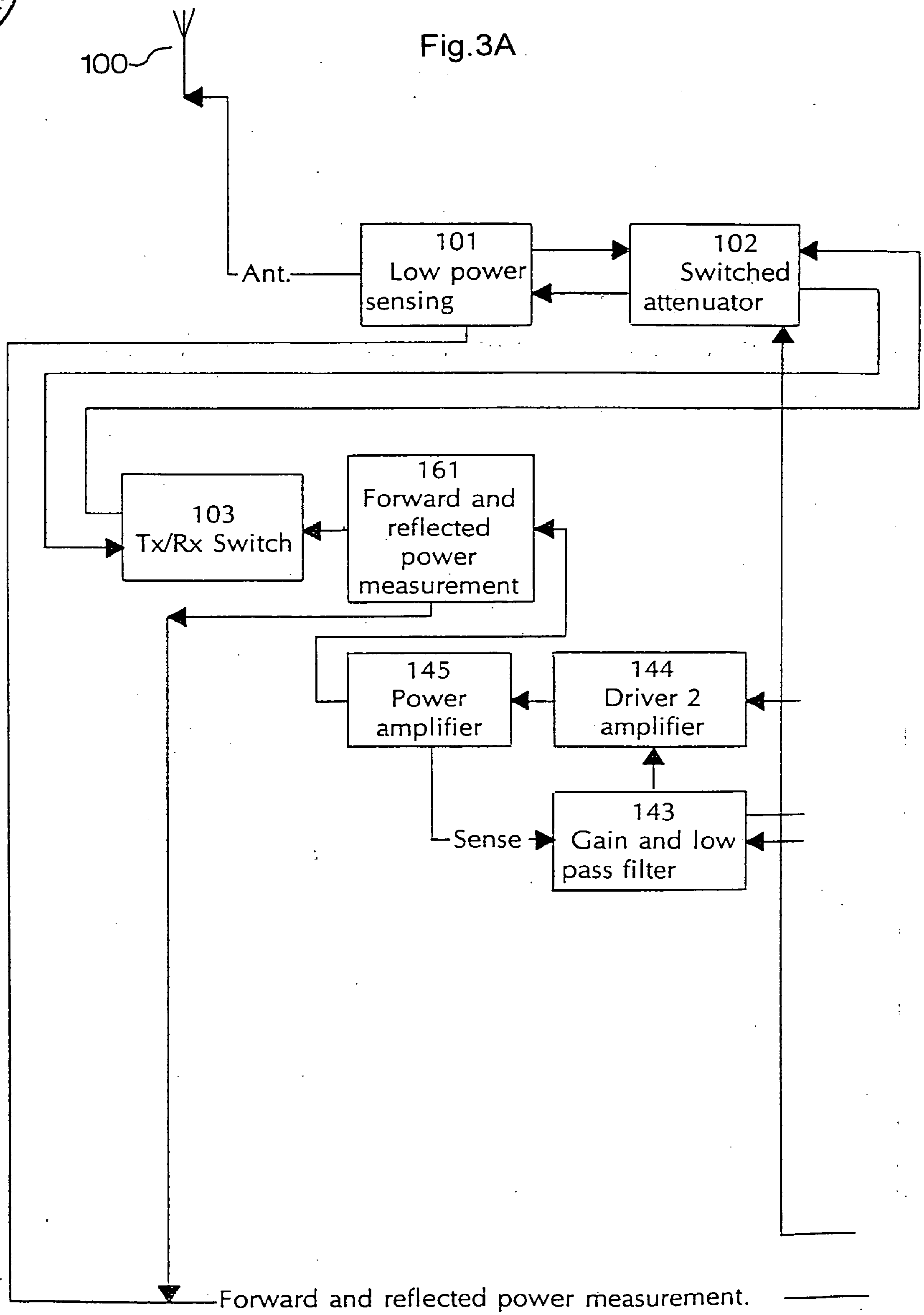
FIG 2E

18
A choses datarate and packet duration based on the ammount of transmit power available at A and the required signal to noise ratio for different data rates and packet durations at B - taking into account the rate of change of pathloss from A to B and noise at B.

19
A examines its transmit data que destined for B as a final destination or relay and "fills" the packet with data segments - were packet size is determined by data rate and duration decided on for the opportunity.

20
A receives acknowledgement from B or monitors to hear B transmit data further,

Fig.3A


100
Ant.
101
Low power
sensing
102
Switched
attenuator
103
Tx/Rx Switch
161
Forward and
reflected
power
measurement
145
Power
amplifier
144
Driver 2
amplifier
143
Gain and low
pass filter
Sense
Forward and reflected power measurement.

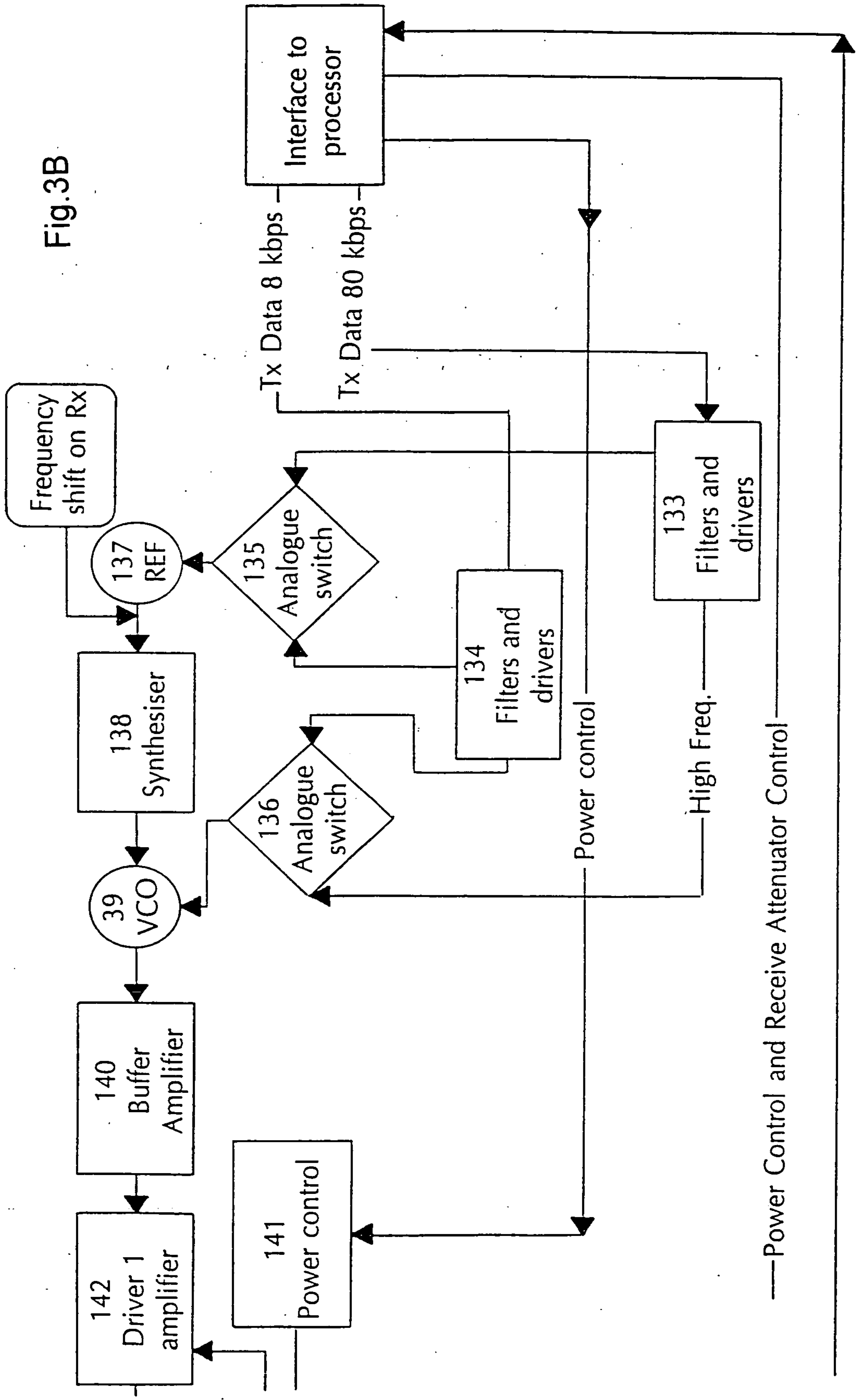

Interface to processor
Tx Data 8 kbps
Tx Data 80 kbps
Frequency shift on Rx
137 REF
135 Analogue switch
134 Filters and drivers
133 Filters and drivers
138 Synthesiser
136 Analogue switch
39 VCO
140 Buffer Amplifier
141 Power control
142 Driver 1 amplifier
Power control
High Freq.
Power Control and Receive Attenuator Control

Fig.3B

Fig.4A

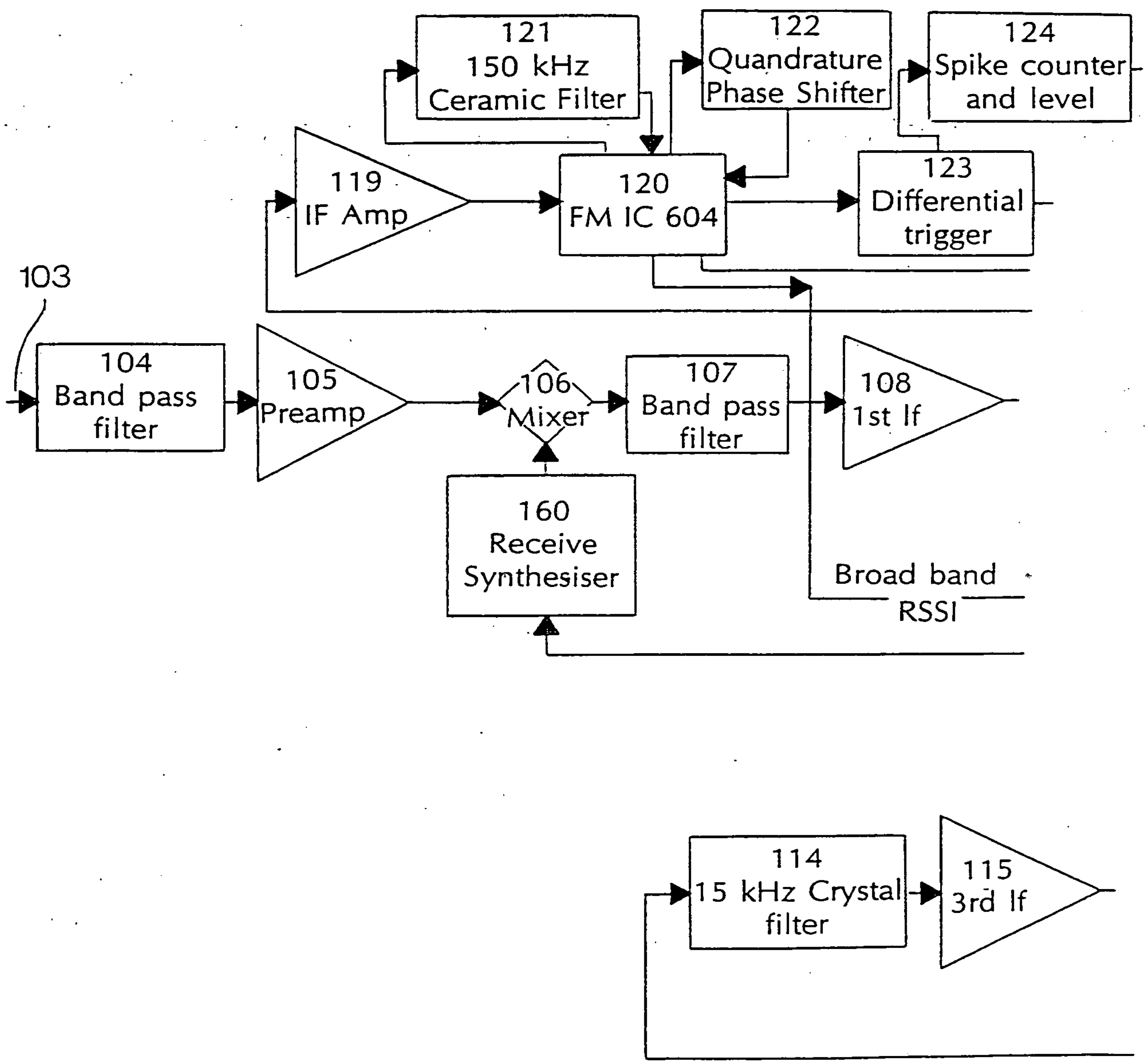

121
150 kHz
Ceramic Filter
122
Quandrature
Phase Shifter
124
Spike counter
and level
119
IF Amp
120
FM IC 604
123
Differential
trigger
103
104
Band pass
filter
105
Preamp
106
Mixer
107
Band pass
filter
108
1st If
160
Receive
Synthesiser
Broad band
RSSI
114
15 kHz Crystal
filter
115
3rd If

Fig.4B

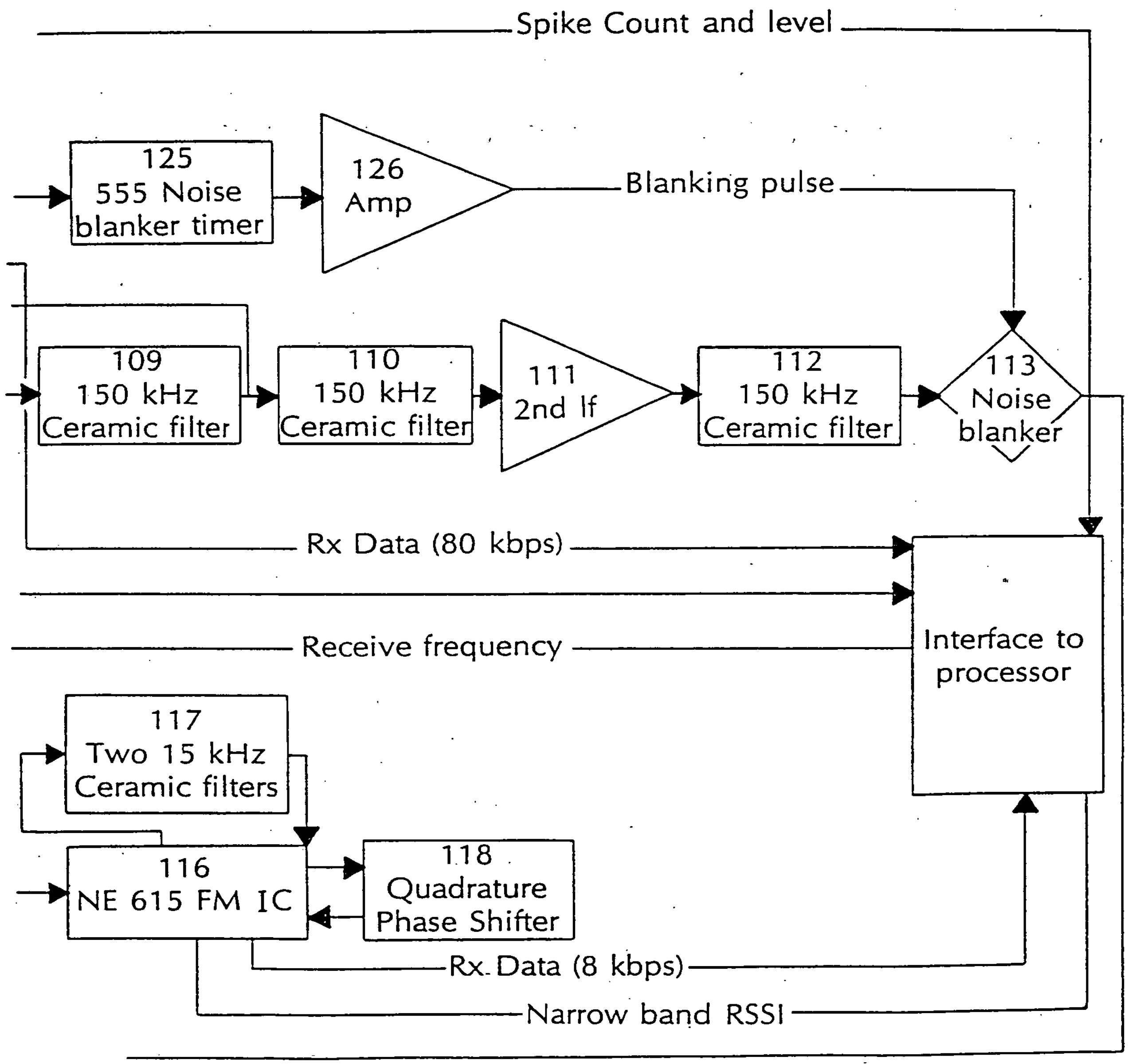

Spike Count and level
125
555 Noise
blanker timer
126
Amp
Blanking pulse
109
150 kHz
Ceramic filter
110
150 kHz
Ceramic filter
111
2nd If
112
150 kHz
Ceramic filter
113
Noise
blanker
Rx Data (80 kbps)
Receive frequency
Interface to
processor
117
Two 15 kHz
Ceramic filters
116
NE 615 FM IC
118
Quadrature
Phase Shifter
Rx. Data (8 kbps)
Narrow band RSSI

Fig.5A

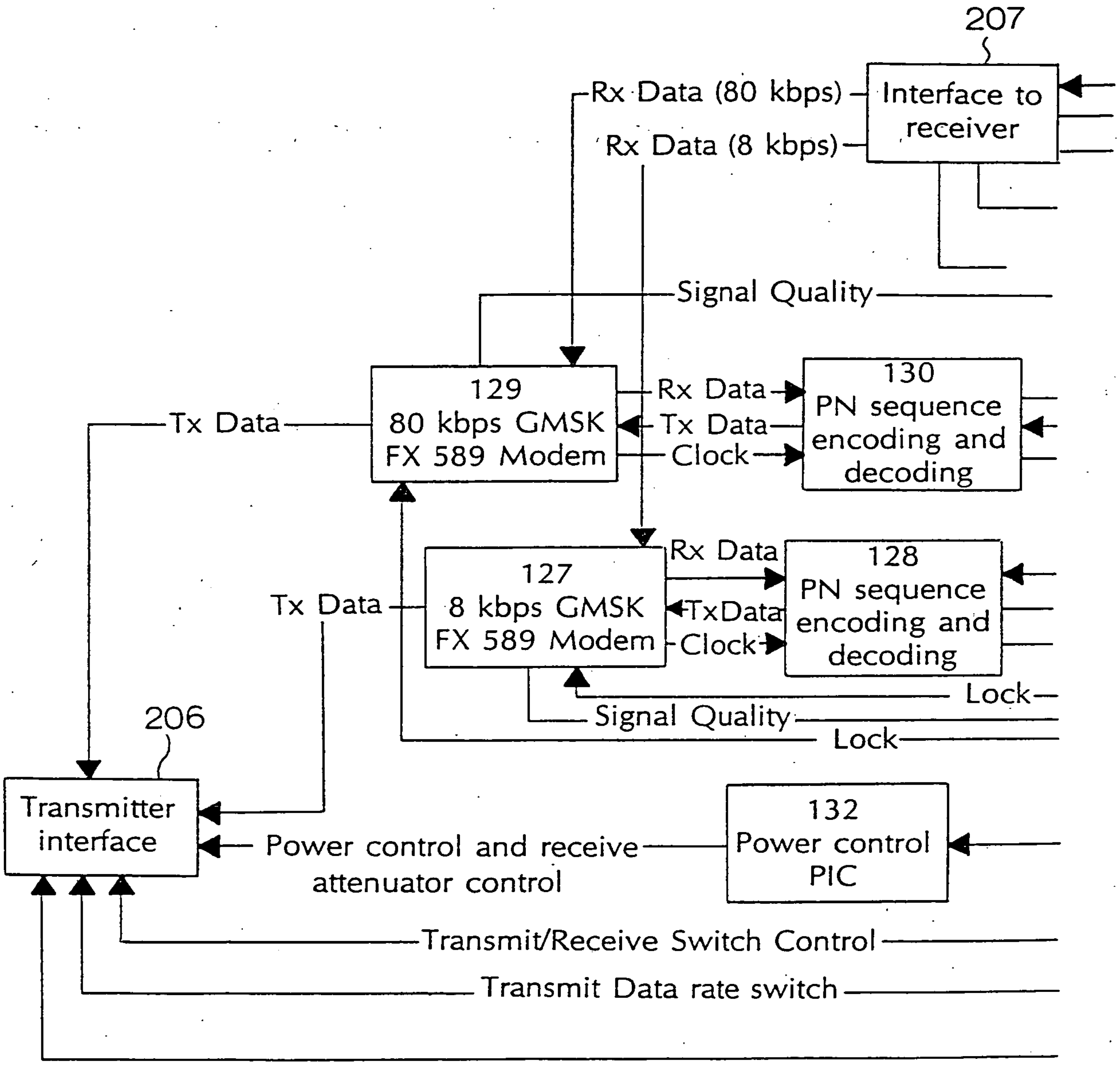
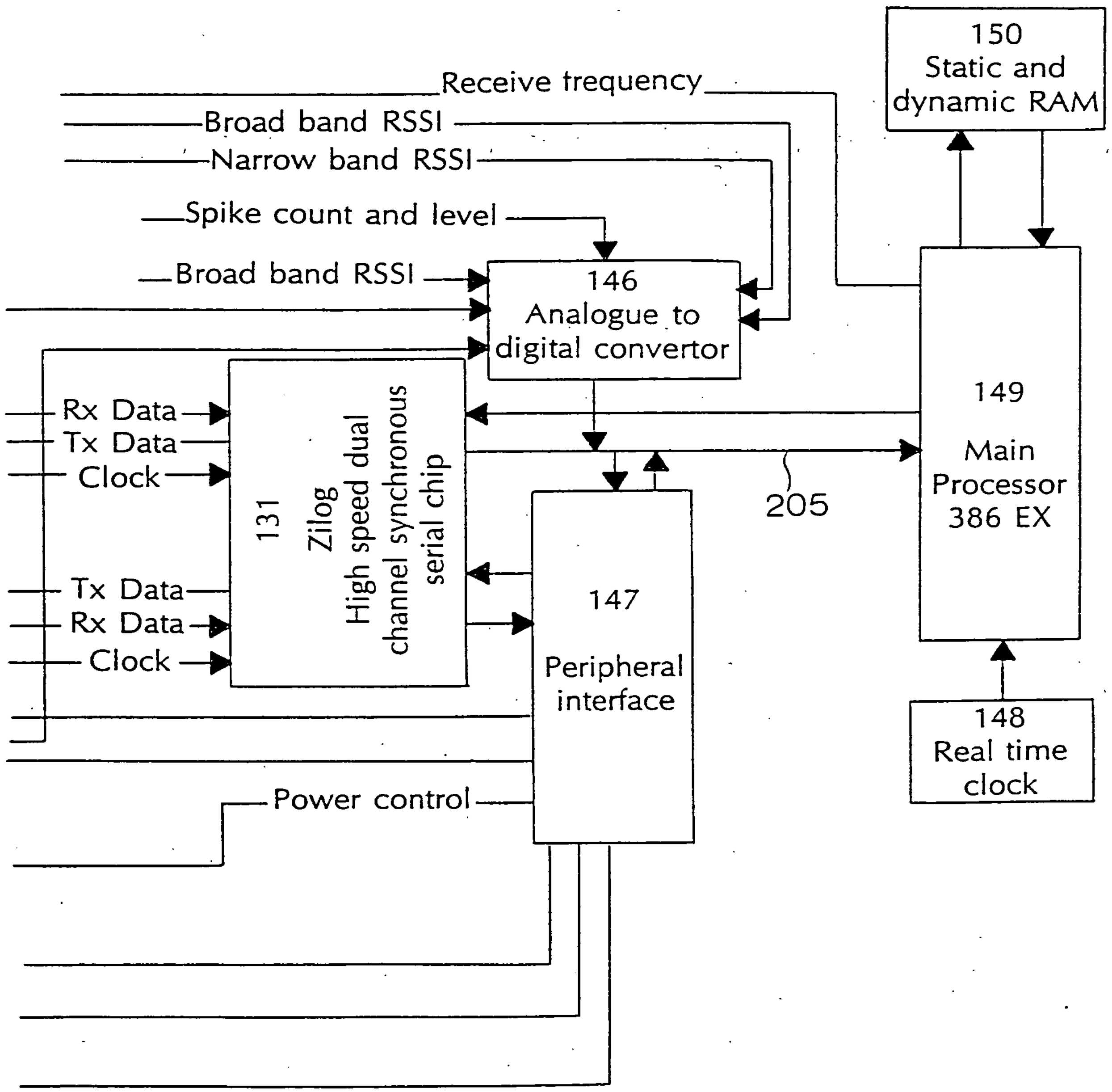

207
Interface to receiver
Rx Data (80 kbps)
Rx Data (8 kbps)
Signal Quality
129
80 kbps GMSK FX 589 Modem
Rx Data
Tx Data
Clock
130
PN sequence encoding and decoding
Tx Data
127
8 kbps GMSK FX 589 Modem
Rx Data
TxData
Clock
128
PN sequence encoding and decoding
Tx Data
Lock
Signal Quality
Lock
206
Transmitter interface
Power control and receive attenuator control
132
Power control PIC
Transmit/Receive Switch Control
Transmit Data rate switch

Fig.5B


150
Static and dynamic RAM
Receive frequency
Broad band RSSI
Narrow band RSSI
Spike count and level
Broad band RSSI
146
Analogue to digital convertor
Rx Data
Tx Data
Clock
131
Zilog
High speed dual channel synchronous serial chip
Tx Data
Rx Data
Clock
149
Main Processor 386 EX
205
147
Peripheral interface
148
Real time clock
Power control

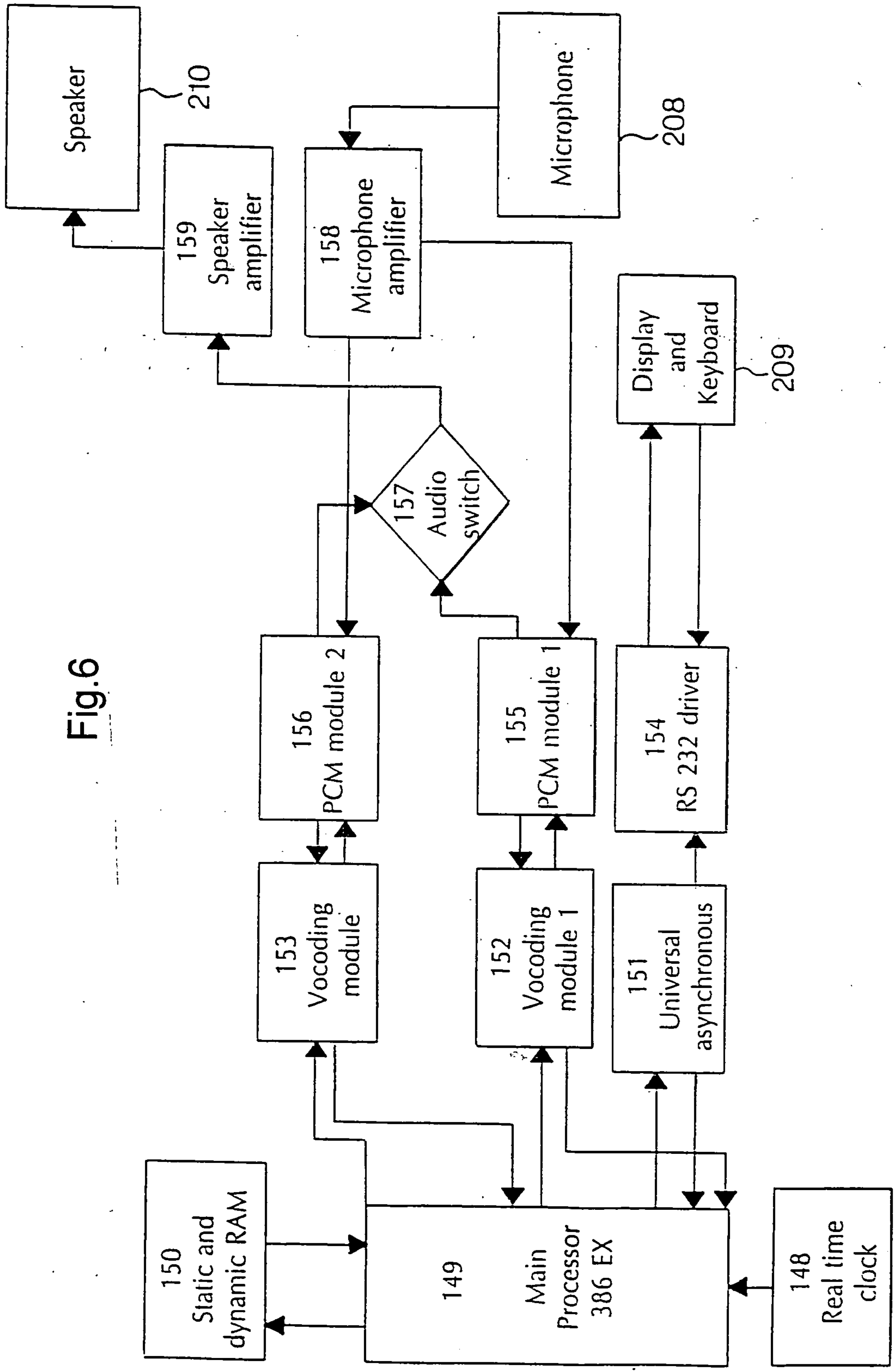

Speaker
210
159 Speaker amplifier
158 Microphone amplifier
Microphone
208
Display and Keyboard
209
157 Audio switch
156 PCM module 2
155 PCM module 1
154 RS 232 driver
153 Vocoding module
152 Vocoding module 1
151 Universal asynchronous
150 Static and dynamic RAM
149 Main Processor 386 EX
148 Real time clock

Fig.6

Fig.7A

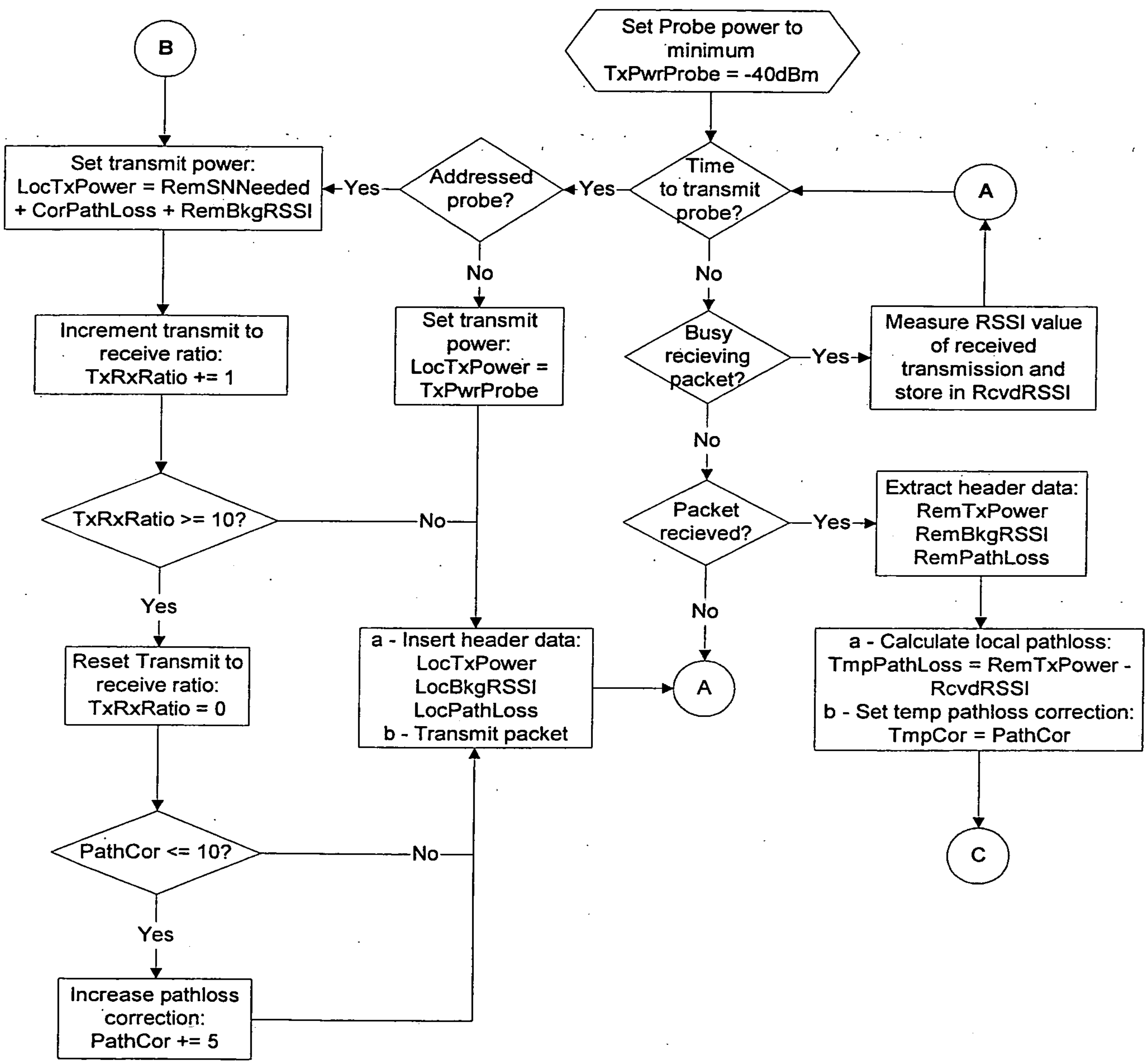

Set Probe power to minimum TxPwrProbe = -40dBm
Time to transmit probe?
Yes
Addressed probe?
Yes
Set transmit power: LocTxPower = RemSNNeeded + CorPathLoss + RemBkgRSSI
No
Set transmit power: LocTxPower = TxPwrProbe
No
Busy recieving packet?
Yes
Measure RSSI value of received transmission and store in RcvdRSSI
A
B
Increment transmit to receive ratio: TxRxRatio += 1
TxRxRatio >= 10?
No
Yes
Reset Transmit to receive ratio: TxRxRatio = 0
PathCor <= 10?
No
Yes
Increase pathloss correction: PathCor += 5
a - Insert header data: LocTxPower LocBkgRSSI LocPathLoss b - Transmit packet
A
No
Packet recieved?
Yes
No
Extract header data: RemTxPower RemBkgRSSI RemPathLoss
a - Calculate local pathloss: TmpPathLoss = RemTxPower - RcvdRSSI b - Set temp pathloss correction: TmpCor = PathCor
C

Fig.7B

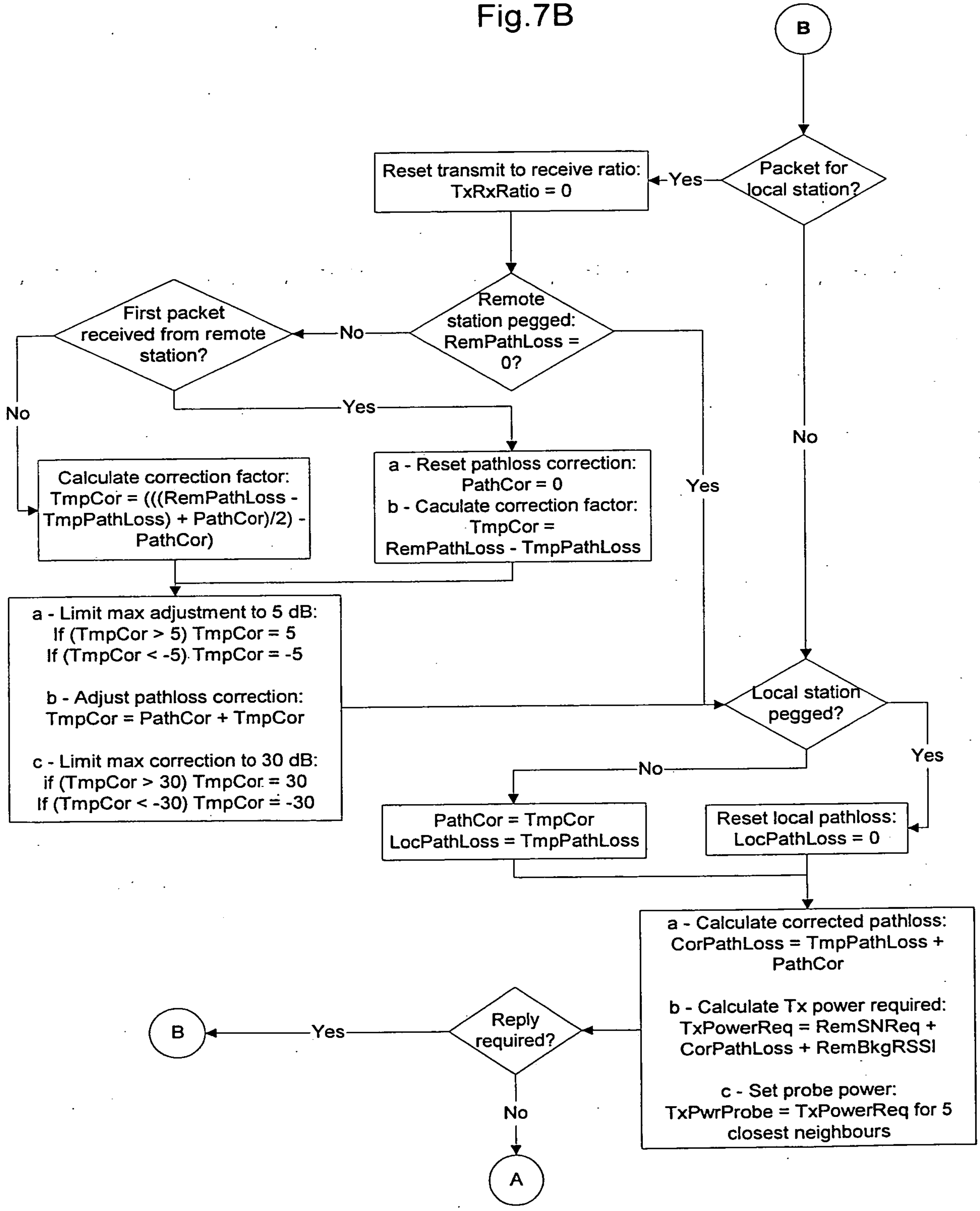

B
Packet for local station?
Yes
Reset transmit to receive ratio: TxRxRatio = 0
Remote station pegged: RemPathLoss = 0?
No
First packet received from remote station?
No
Yes
Yes
No
Calculate correction factor: TmpCor = (((RemPathLoss - TmpPathLoss) + PathCor)/2) - PathCor)
a - Reset pathloss correction: PathCor = 0
b - Caculate correction factor: TmpCor = RemPathLoss - TmpPathLoss
a - Limit max adjustment to 5 dB: If (TmpCor > 5) TmpCor = 5 If (TmpCor < -5) TmpCor = -5
b - Adjust pathloss correction: TmpCor = PathCor + TmpCor
c - Limit max correction to 30 dB: if (TmpCor > 30) TmpCor = 30 If (TmpCor < -30) TmpCor = -30
Local station pegged?
No
Yes
PathCor = TmpCor LocPathLoss = TmpPathLoss
Reset local pathloss: LocPathLoss = 0
a - Calculate corrected pathloss: CorPathLoss = TmpPathLoss + PathCor
b - Calculate Tx power required: TxPowerReq = RemSNReq + CorPathLoss + RemBkgRSSI
c - Set probe power: TxPwrProbe = TxPowerReq for 5 closest neighbours
Reply required?
Yes
B
No
A

Fig.8A

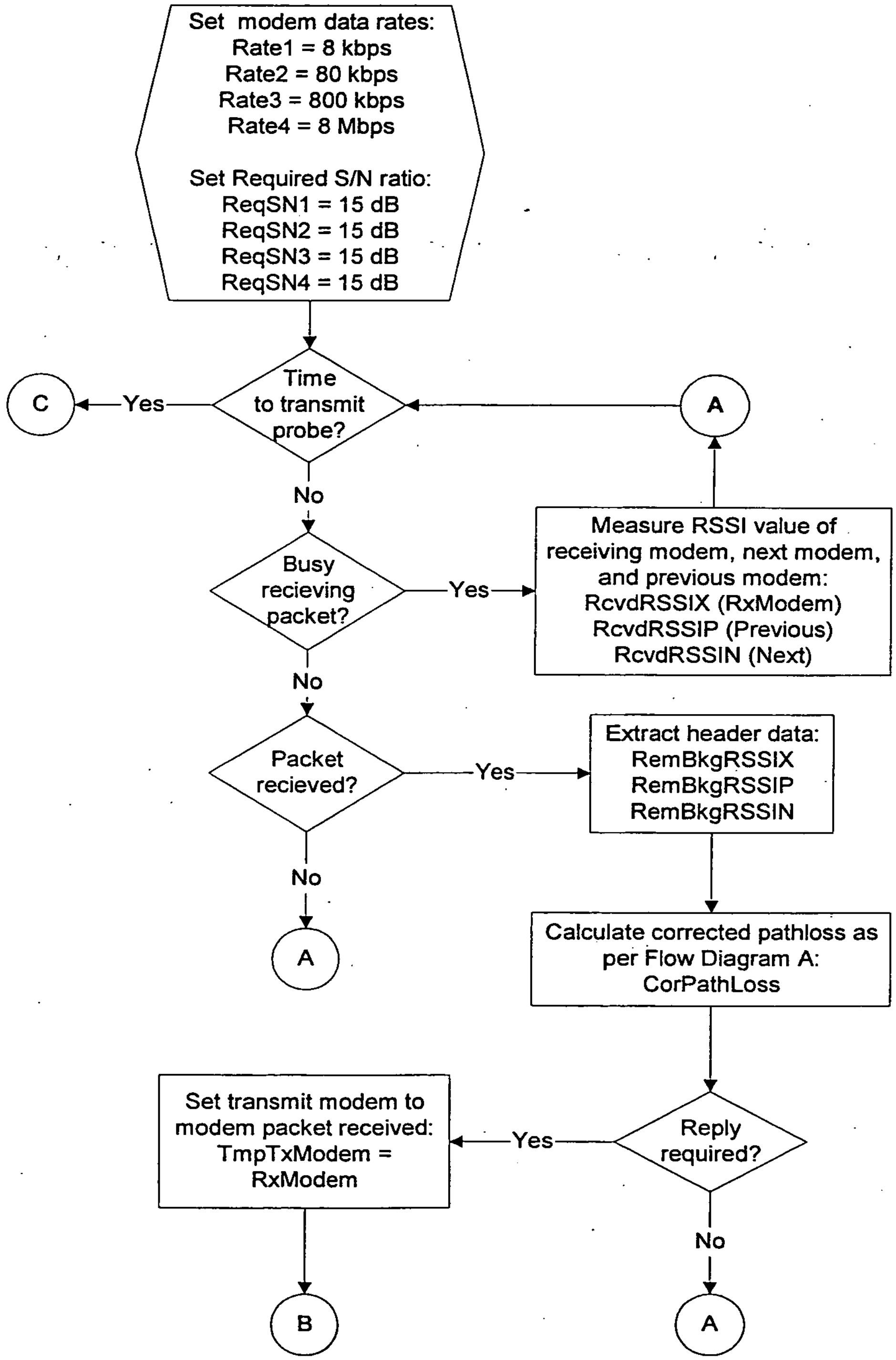

Set modem data rates:
Rate1 = 8 kbps
Rate2 = 80 kbps
Rate3 = 800 kbps
Rate4 = 8 Mbps
Set Required S/N ratio:
ReqSN1 = 15 dB
ReqSN2 = 15 dB
ReqSN3 = 15 dB
ReqSN4 = 15 dB
Time to transmit probe?
Yes
C
A
No
Busy recieving packet?
Yes
Measure RSSI value of receiving modem, next modem, and previous modem:
RcvdRSSIX (RxModem)
RcvdRSSIP (Previous)
RcvdRSSIN (Next)
No
Packet recieved?
Yes
Extract header data:
RemBkgRSSIX
RemBkgRSSIP
RemBkgRSSIN
No
A
Calculate corrected pathloss as per Flow Diagram A:
CorPathLoss
Set transmit modem to modem packet received:
TmpTxModem = RxModem
Yes
Reply required?
No
B
A

Fig.8B

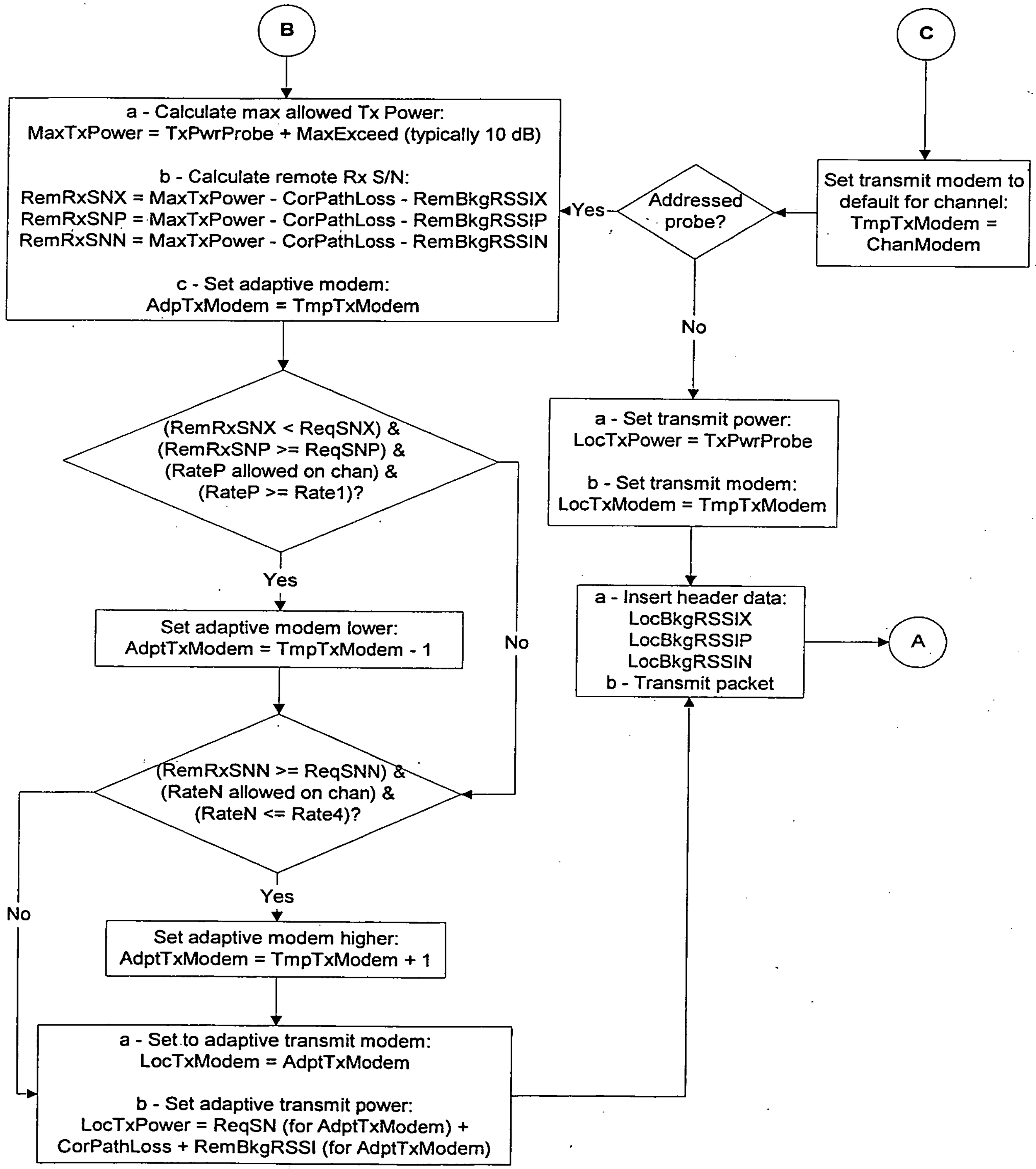

B
a - Calculate max allowed Tx Power:
MaxTxPower = TxPwrProbe + MaxExceed (typically 10 dB)
b - Calculate remote Rx S/N:
RemRxSNX = MaxTxPower - CorPathLoss - RemBkgRSSIX
RemRxSNP = MaxTxPower - CorPathLoss - RemBkgRSSIP
RemRxSNN = MaxTxPower - CorPathLoss - RemBkgRSSIN
c - Set adaptive modem:
AdpTxModem = TmpTxModem
C
Set transmit modem to default for channel:
TmpTxModem = ChanModem
Addressed probe?
Yes
No
(RemRxSNX < ReqSNX) &
(RemRxSNP >= ReqSNP) &
(RateP allowed on chan) &
(RateP >= Rate1)?
Yes
No
Set adaptive modem lower:
AdptTxModem = TmpTxModem - 1
a - Set transmit power:
LocTxPower = TxPwrProbe
b - Set transmit modem:
LocTxModem = TmpTxModem
a - Insert header data:
LocBkgRSSIX
LocBkgRSSIP
LocBkgRSSIN
b - Transmit packet
A
(RemRxSNN >= ReqSNN) &
(RateN allowed on chan) &
(RateN <= Rate4)?
Yes
No
Set adaptive modem higher:
AdptTxModem = TmpTxModem + 1
a - Set to adaptive transmit modem:
LocTxModem = AdptTxModem
b - Set adaptive transmit power:
LocTxPower = ReqSN (for AdptTxModem) +
CorPathLoss + RemBkgRSSI (for AdptTxModem)

Fig.9A

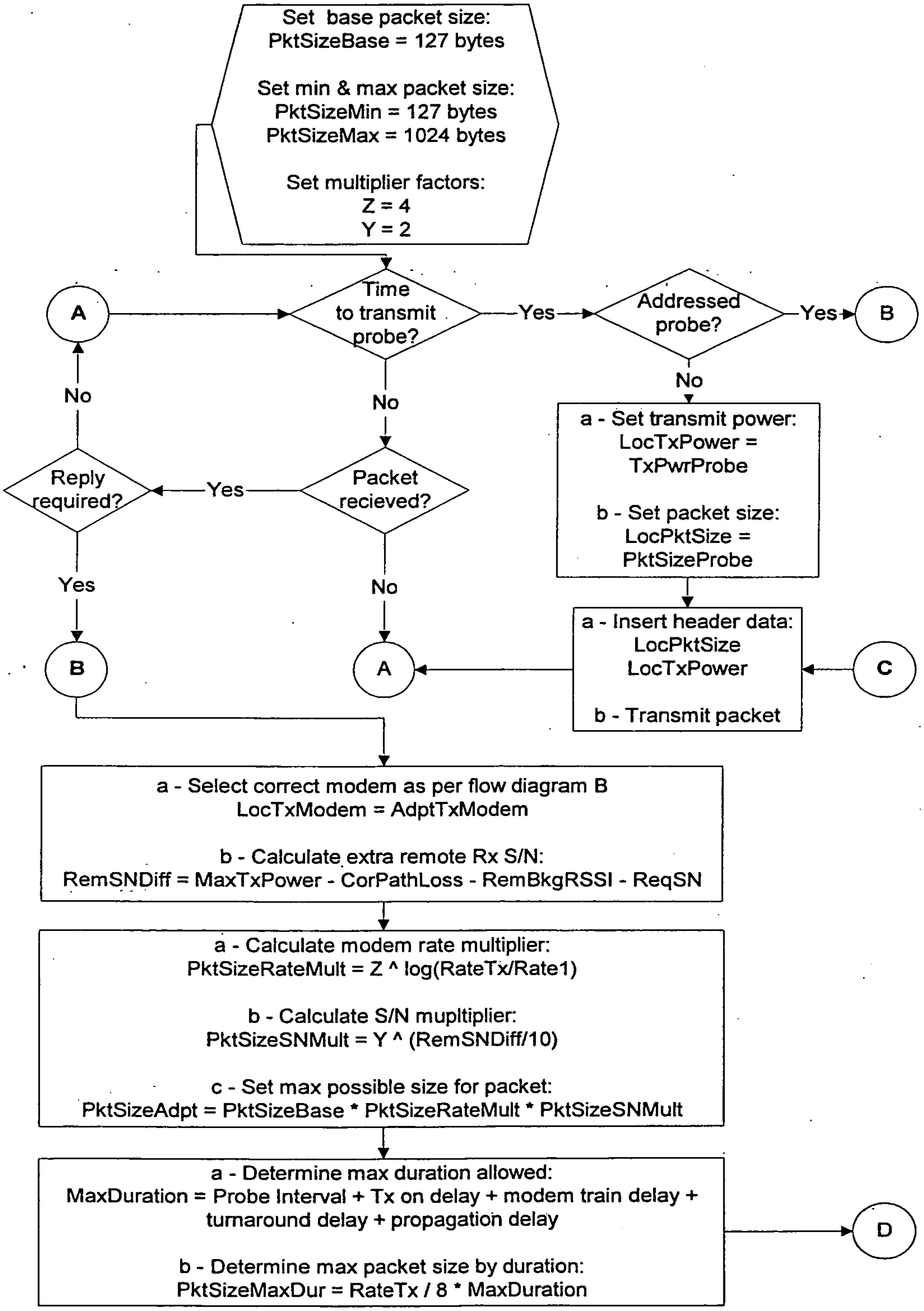
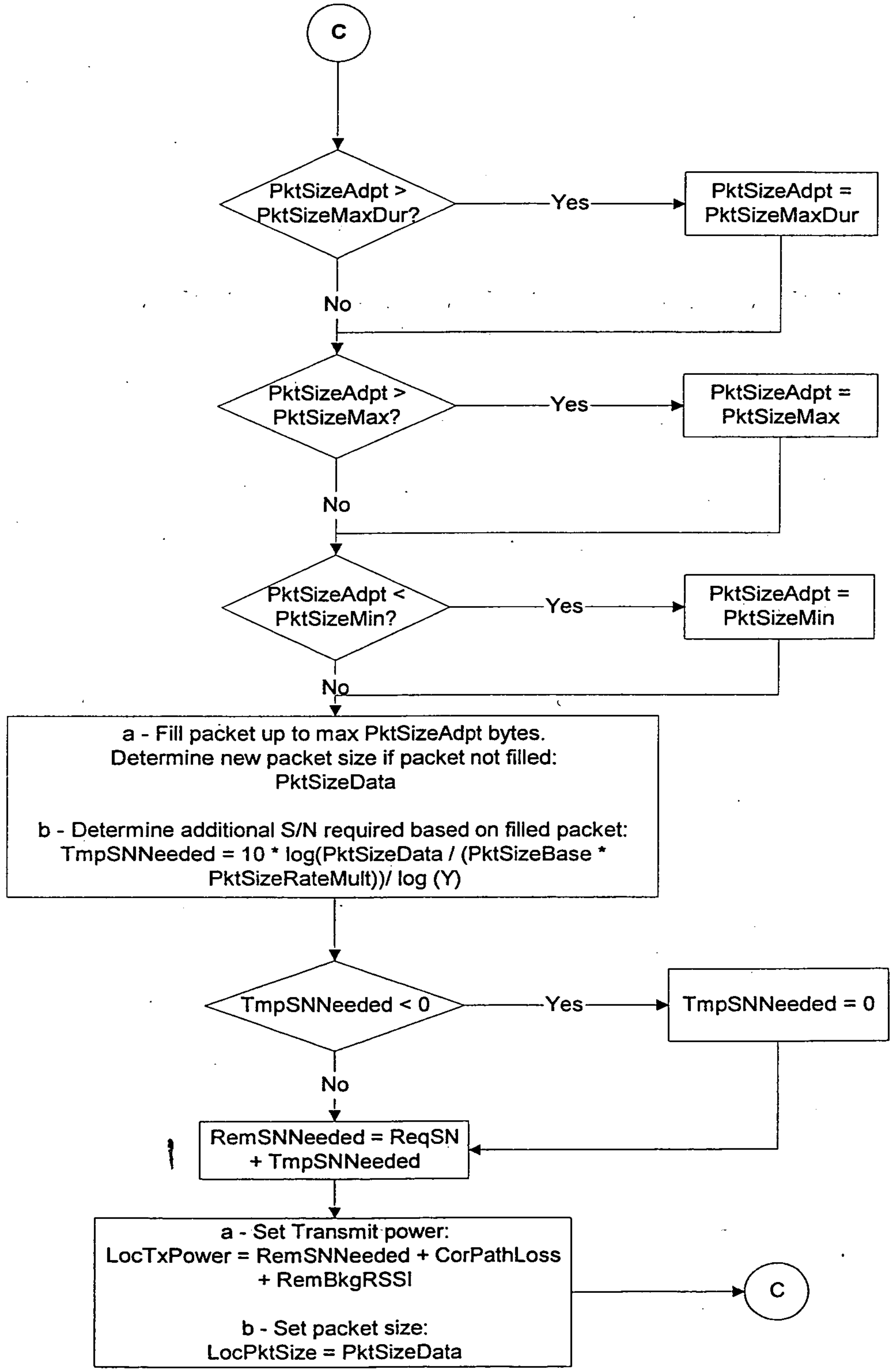

Set base packet size:
PktSizeBase = 127 bytes
Set min & max packet size:
PktSizeMin = 127 bytes
PktSizeMax = 1024 bytes
Set multiplier factors:
Z = 4
Y = 2
A
Time to transmit probe?
Yes
Addressed probe?
Yes
B
No
No
a - Set transmit power:
LocTxPower = TxPwrProbe
b - Set packet size:
LocPktSize = PktSizeProbe
No
Reply required?
Yes
Packet recieved?
Yes
No
B
A
a - Insert header data:
LocPktSize
LocTxPower
b - Transmit packet
C
a - Select correct modem as per flow diagram B
LocTxModem = AdptTxModem
b - Calculate extra remote Rx S/N:
RemSNDiff = MaxTxPower - CorPathLoss - RemBkgRSSI - ReqSN
a - Calculate modem rate multiplier:
PktSizeRateMult = Z ^ log(RateTx/Rate1)
b - Calculate S/N mupltiplier:
PktSizeSNMult = Y ^ (RemSNDiff/10)
c - Set max possible size for packet:
PktSizeAdpt = PktSizeBase * PktSizeRateMult * PktSizeSNMult
a - Determine max duration allowed:
MaxDuration = Probe Interval + Tx on delay + modem train delay + turnaround delay + propagation delay
b - Determine max packet size by duration:
PktSizeMaxDur = RateTx / 8 * MaxDuration
D

Fig.9B


C
PktSizeAdpt > PktSizeMaxDur?
Yes
PktSizeAdpt = PktSizeMaxDur
No
PktSizeAdpt > PktSizeMax?
Yes
PktSizeAdpt = PktSizeMax
No
PktSizeAdpt < PktSizeMin?
Yes
PktSizeAdpt = PktSizeMin
No
a - Fill packet up to max PktSizeAdpt bytes.
Determine new packet size if packet not filled:
PktSizeData
b - Determine additional S/N required based on filled packet:
TmpSNNeeded = 10 * log(PktSizeData / (PktSizeBase * PktSizeRateMult))/ log (Y)
TmpSNNeeded < 0
Yes
TmpSNNeeded = 0
No
RemSNNeeded = ReqSN + TmpSNNeeded
a - Set Transmit power:
LocTxPower = RemSNNeeded + CorPathLoss + RemBkgRSSI
b - Set packet size:
LocPktSize = PktSizeData
C